G.W. Mechelecia



MARCH 1954





U·S·S CARILLOY electric-furnace aircraft quality steel meets every requirement for these vital parts. The precision machining and expert heat treatment it gets at Cleveland Pneumatic Tool Company complete the job.

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USS

UNITED STATES STEEL



A MESSAGE TO
COLLEGE ENGINEERING
STUDENTS

from A. C. Monteith, Vice-President
in Charge of Engineering and Research,
Westinghouse Electric Corporation,
Queen's University, Kingston, Ontario, 1923

The second most important decision in your life

Now, as you near graduation, you are about to make a decision—second in importance only to choosing your life's partner.

I'm talking, of course, about that all-important first job. Which company will it be? I wouldn't presume to answer that question for you. But I would like to emphasize the importance of this decision.

You have a lot at stake. The direction your career takes will most certainly be influenced by the company with which you cast your lot. May I offer a few personal suggestions.

Choose a company not for its bigness or smallness, but for how it will treat you as an individual. Choose it not only for its engineering activities alone, but also for how it is set up to help its engineers develop themselves professionally. Choose your company with an eye on the opportunities ahead—and an eye on the future of the company itself. Above all, select a company that has a definite program to help you determine the work for which you are best fitted.

Only you can make this vital decision. Whatever it may be—good luck!

G-10275

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Westinghouse

For information on career opportunities with Westinghouse, consult the Placement Officer of your university, or send for our 44-page book, *Finding Your Place in Industry*.

Write: Mr. J. B. Parks, Regional Educational Co-ordinator, Westinghouse Electric Corporation, 3001 Walnut Street, Philadelphia 4, Pennsylvania.





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To MAINTAIN a top position in the aircraft industry for more than 36 years requires the engineering of new designs through the application of engineering experience plus imaginative thinking. Chance Vought Aircraft has offered the opportunity for such a career since the day of its founding in 1917 when it began the design of the VE-7, a two-seated biplane which was redesigned for the Navy as the VE-9.

During the past 36 years young engineers and scientists have been an important source of these new ideas. Today, more so than ever before, many interesting career opportunities are available at Chance Vought as the company designs the latest versions of the F7U-3 Cutlass, the "Regulus" guided missile and other high speed fighter aircraft projects.

The achievements of the past 36 years at Chance Vought, great as they have been, offer little means of evaluating fully the potential of aviation's future. If you are interested in a position with an unlimited future, a position with the constant responsibility of evaluating and applying new ideas, if you are interested in working for a company with a wealth of experience in its line and yet ambitious to create the latest designs in its field, investigate the employment opportunities at Chance Vought.

Engineering and scientific graduates are invited to contact their Placement Officer to arrange for a personal interview when the Chance Vought Engineering Personnel Representative visits on campus.

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ON OUR COVER

Our Art Editor, Harold Gullen's conception of the senior engineering student. Hal is not an engineer.

FRONTISPIECE

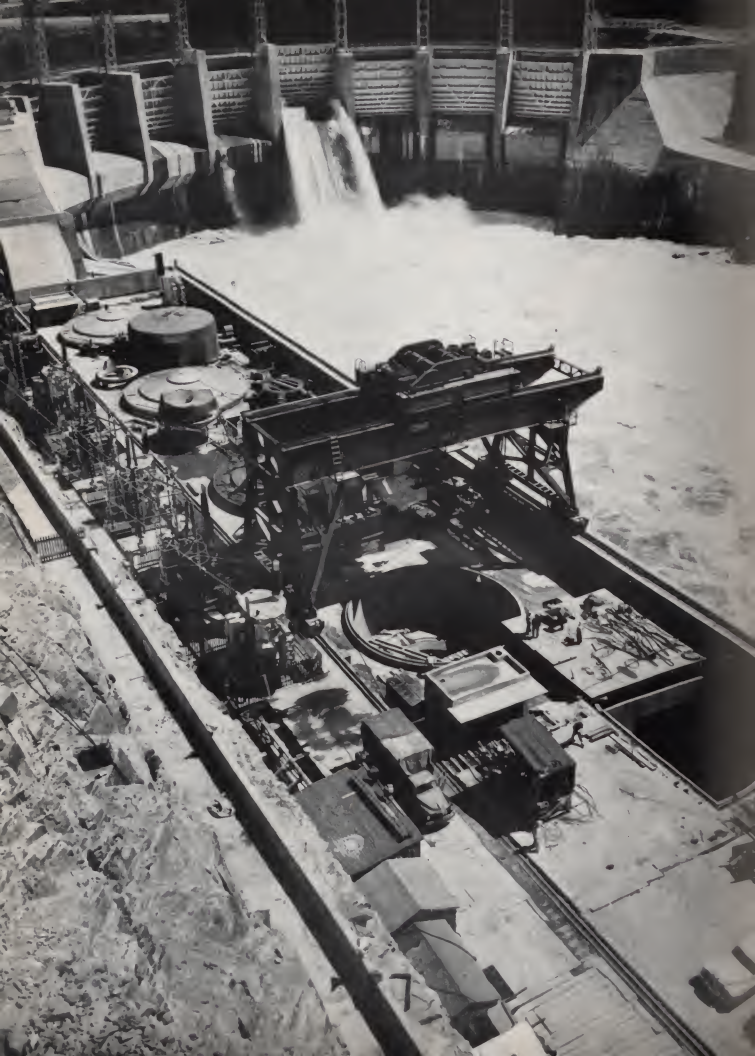
The Cabinet Gorge hydroelectric development on the Clark Fork River in northern Idaho was completed last year by the Washington Water Power Company. The first of four Westinghouse 50,000-kw generating units was on the line just 21 months after the start of construction. Despite unusually severe conditions of weather, terrain, and the wild nature of the river, the task of diverting the river and pouring concrete for the 208-foot high, 600-foot long dam was accomplished in a single season between river flood stages.

— COURTESY WESTINGHOUSE ELECTRIC

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To Whom It Does Concern!

To the Alumni,

Now is the time for you to renew your subscription to the Mechleciv. *The response of the alumni to our subscription campaign last year was better than previous years, but still left much to be desired. This year the Board of Editors has inaugurated a policy to direct the content of your magazine towards the technical and scientific work being undertaken at the University, general news of the School of Engineering; and also has had some professors you alumni well remember contribute to the magazine. In making this change in policy the Board of Editors had in mind the idea of arousing more interest from our alumni.*

In our May issue we hope to announce the breaking of ground for the new engineering building and to give a complete story of the construction and layout complete with floor plans and architects' renderings. To do this will require the expenditure of a great amount of time and effort on the part of the student staff. The illustrations and additional page space that will be required will tax the magazine very heavily financially. The foregoing is an example of the problems your Board of Editors face with each issue.

The Mechleciv *receives income from three sources: the Engineers' Council, advertising, and alumni subscriptions. Each year the Engineers' Council subsidizes the* Mechleciv *to an amount determined by vote of the Council. This amount varies little from year to year and therefore can be assumed to be a constant income. The amount of advertising we receive depends upon what the advertisers may think of our magazine and they are influenced by the circulation and paid subscriptions of the magazine. You can readily see how important alumni subscriptions are to the* Mechlelciv *in this sense. Also, just as or more important is the money derived from alumni subscriptions. This money may make it possible to illustrate an article which would otherwise have no illustrations. It may make it possible to use a more striking or original cover or to use an additional color. Very shortly you will receive a letter requesting your subscription for the current year. But, please do not wait for this letter to mail in your subscription. On page 12 of this issue is a subscription form. In filling out this form please let us have news about yourself and comments on* Mechleciv.

Remember, *your General Alumni Association dues do not include subscription to* Mechleciv.

To Students and Alumni,

The Evening of Saturday, May 1st, will be the big night for the School of Engineering. It is the night of the Annual Engineers' Ball and Banquet. The success of this affair depends upon the attendance of the students. However, alumni are urged to attend and the more recent graduates will probably be very much in evidence. Let's all turn out to support this event and have a helluva good time. The banquet is at 7:30 PM and dancing commences at 9:00 PM and lasts until 12:00. Tickets may be obtained from any Engineers' Council representative, at the Engineering Office, or at the door.

To the Students,

Do you know of the existence of the Davis-Hodgkins house at 731 22nd Street? If not, it is time you became acquainted with it. The University has given this house to the engineering students for their use. You can grab a quick cup of coffee any time of day, usually get help from some classmate on that problem that has you stumped, or just sit around and shoot the bull. Come on around and get acquainted with the D-H house.

Graduate Study - - - For Free

by Herb Rosen, BSE '54

One day I was wandering down that dark hallway bordering the Dean's Office and noticed a bulletin board in conventional G. W. condition —cluttered and stacked several papers high. But the colors of some of the pamphlets showing through the dust caused me to take just a little peek. What a bonanza I found! Opportunities galore! Masters degrees for the asking. A vacation in sunny Florida . . . or is it sunny California . . . for FREE! Some offers even had a stipend attached. Think of it, pay while you learn! And a chance to loll in the sun. What am I talking about? Graduate assistantships, scholarships, and fellowships from colleges and universities in the East, West, and the South. And a few from private industry, too. Here's the story:

Some people who have made a financial success out of their lives in this country have left trust funds in various institutions as living memorials of their gratitude. The Ford Foundation, for instance, believes that young men and women should broaden their knowledge of the critical areas in Asia, the Near and the Middle East. Therefore, they offer foreign study and research fellowships to graduates or graduating seniors who can fulfill their broad requirements. The National Science Foundation offers Fellowships in Biology, Engineering, Mathematical, Medical and Physical Sciences that have annual stipends ranging from $1400 to $3400 per year. And the General Electric Educational and Charitable Fund has two fellowships to offer: The Charles A. Coffin Felowships and the Gerard Swope Fellowships. (Bernie Kilday won one of these last year). Oddly, the application blank has 19 questions on it and appears to be the safest way I know of getting some of that "easy money" people talk about. And finally, the Highway Research Board of the National Academy of Sciences is offering prizes of $1000, $700, $500, and $300 for submitting an original essay on any phase of highway transportation. And G. W. engineers may readily consult a nationally famous highway expert, Dr. Bruce D. Greenshields.

At this point I should caution the curious: some of these awards and some of those to follow have deadlines that are past or too close to make; however, they are offered each year and material contained in this article may be worth storing away for future reference. Moreover, most or all of the application details are omitted. The fountainhead of information is the Dean's Office, where most of these notices are filed. Furthermore, if you should be interested and make this known to the Dean, Dr. Mason will do everything in his power to help you.

As I mentioned earlier, scholarships and fellowships are awarded by institutions from the East, West and the South. Harvard University (Boston, Massachusetts) has a very extensive Financial Aid Program. Their Westinghouse Educational Foundation Fellowship offers a stipend that amounts to $1000. The University, too has a small number of scholarships available to qualified students. A gift from the George F. Baker Foundation enables the University to provide assistance to men who rank in the top 10 percent.

Cornell University (Ithaca, New York) has many offers. The Hannibal C. Ford Fellowship enables an outstanding graduate from an engineering college to pursue full-time study in mechanical or electrical engineering or engineering physics. This $4000 Fellowship will pay the university expenses and give the recipient a cash stipend of $2500 as well. In addition, Cornell has 54 grants with values between $750 and $2500 a year. For those interested in advance work in civil engineering, Cornell also has four grants at $1800 and two others for $2500. Like many of the other Universities to be mentioned, Cornell has Instructorships in Engineering with salaries ranging from $3000 to $4000 per nine-month year. These appointments permit the holder to earn residence credit as a graduate student at a one-half-time rate. (Not too unfamiliar to many G. W. undergrads.) At varying scales, the

University offers research, teaching, and graduate assistantships.

Lehigh University (Lehigh, Pennsylvania) offers fellowships and assistantships that have value from $100 a month to $2400 for full-time graduate work. Clarkson College of Technology, (Potsdam, New York) from their brochure, seems to foster the notion that a good worker and student is worth his weight. They are offering $5400 a year and I'm willing to gamble that they get some very good people for that amount. M. I. T. (Cambridge, Massachusetts) has a program that is designed to attract married men as well. However, I feel that I should throw in another word of caution: All of these offers should be thoroughly investigated. It is a known fact that some Universities use the awards technique to get good people and then virtually exploit them.

Among the other Eastern institutions offering assistantships are The Pennsylvania State University (State College, Pennsylvania) in mineral industries with stipends from $1180 to $2352. The University of Connecticut (Storrs, Connecticut) has more than 70 graduate assistantships that range from $147.50 per month to $1327.50 for nine months. And the University of Pennsylvania (Philadelphia, Pennsylvania) offers six fellowships ($700 to $1200) in architecture. Other schools offering similar awards are Princeton University (Princeton, New Jersey) and the Carnegie Institute of Technology (Pittsburgh, Pennsylvania).

Out West, the University of Wisconsin (Madison, Wisconsin) offers three to six fellowships (about $1200) that permit full-time graduate study, and do not require service on the part of the students. They too give assistantships that pay from $1150 to $1800 per academic year. The graduate courses given by Northwestern University (Evanston, Illinois) cover wide specialties in chemical, civil, electrical, mechanical, and industrial engineering, metallurgy, and theoretical and applied mechanics. Approximately 275 teaching fellowships and other fellowships are made available to students by the University of Notre Dame (Notre Dame, Indiana). Iowa State College of Agriculture and Mechanics Arts boasts that it owns and operates all three types of broadcasting stations —radio, FM, and television. They also offer assistants $540 to $1800 per year. Some of the AFROTC students may be interested in the extensive aeronautical engineering facilities at The Ohio State University (Columbus, Ohio) as well as the fellowships, and research associateships.

Way out West, the California Institute of Technology prescribes to the idea of specialization but with a broad strengthening of the fundamental concepts of the basic sciences. Their assistantships carry stipends at the rate of $1000, but special Fellowships are also available. What may sound like a job offer comes from the Institute of Numerical Analysis of the University of California, Los Angeles. Its for those students interested in numerical analysis and electronic digital computers. They offer between $1700 and $2600 per calendar year.

That continually moving Mason-Dixon line permits me to place George Washington University in the South. The scholarships and awards available to engineers are listed in the University Bulletin, starting on page 29. Farther South the University of North Carolina (Raleigh, North Carolina) offers assistantships ($1200) and Fellowships ($1200 to $1800) in ceramics, diesel, geological, and nuclear engineering. About the same structure is available from Virginia Polytechnic Institute (Blacksburg, Virginia). The Graduate Divsion of Georgia Institute of Technology (Atlanta, Georgia) apparently has made a successful job of obtaining Fellowships for their institution. Most of the southern power companies have contributed to scholarships in Electrical Engineering. In fact, theirs is such an ambitious and successful program, I'm going to use valuable space to list the benefactors—most of whom offer, at a minimum, tuition fees and a living allowance. They include: Shell Oil, T. E. Stribling, Socony-Vacuum Oil, Tennessee Eastman, Texas Company, Celanese Corporation, Rayonier Corporation, Delta Air Lines, Dow-Corning, Gulf Oil, Humble Oil, Phillips Petroleum, Southern Airways, the University also offers tuition scholarships as well as the regular assistantships. And, I hear, many go begging—not even applied for!

The University of Tennessee (Knoxville, Tennessee) advertises that it has research fellowships, assistantships, and instructorships at stipends up to $2000. And that other place in the sun, the University of Florida (Gainsville, Florida) has fellowships and assistantships between $900 and $1600.

Now, to tie all of this material into one tight conclusion. For one, there are many scholarships and fellowships available from many colleges. Those mentioned in this article by no means exhaust the list. The teaching stipends average around $1200 per nine-month

(Please turn to Page 20)

Vibration Control Materials

By ROBERT VAN SICKLER, BME '55

INTRODUCTION

In almost every application of machinery today, a problem of vibration isolation exists. In many cases, fortunately, the problem has been solved; in many other cases, it has not.

Finding the right answer for eliminating disturbances set up by machinery vibration is not always an easy task. There are many different ways of isolating machinery—some ways permanent, some ways temporary, and each method with a different efficiency.

The purpose of this paper is to present in more or less simple terms the qualities to be considered in selecting an isolation material. The discussion will lead toward the two basic types of isolation mounts in industry today—rubber-in-shear and steel springs.

This discussion will only touch upon some of the basic isolation principles involved in material selection; it is impossible to cover the whole field of vibration isolation in but a few pages.

PROPERTIES OF MATERIALS

Properties Described in Theory of Vibration Control

In order to describe the merits of the different isolation materials, a brief resume of the theory of vibration control must be undertaken.

In analyzing a vibration problem, several major factors must be considered—the frequency of the isolating material, and the degree of vibration isolation required.

Disturbing Frequency: The disturbing frequency, f_D, is the number of times per second or minute that the vibration occurs. The lowest frequency is the most important, since if it is isolated, all higher frequencies are also isolated.

The disturbing frequency for most machinery equals the r.p.m. of the machine. There are exceptions to this rule, as in the case of a milling machine where the vibration frequency equals the r.p.m. of the spindle multiplied by the number of teeth on the cutter.

Natural Frequency: The natural frequency, f_N, is a property of a resilient material. It is related to the amount of deflection in the material when a load is applied. If a force is given to a loaded resilient material to give a slight additional displacement and is then released, the materal will oscillate at a definite frequency. This is the natural frequency and is given by the following equation:

$$f_N = 188 \left[\frac{1}{d_{ST}}\right] \text{ cycles per minute}$$

where dst is the deflection measured in inches under a static load. The graph of this equation is shown in figure one.

Isolation Efficiency: The isolation efficiency depends upon the ratio of the disturbing frequency to the natural frequency of the material. It may be expressed by the following equation:

$$\text{percentage efficiency} = 100\left[1 - \frac{1}{1 - \left(\frac{f_D}{f_N}\right)^2}\right]$$

This is an important relationship to know, since the isolation material is selected largely upon its efficiency of isolation with respect to the disturbing frequency.

It may be seen from the above equation that the efficiency increases as the ratio f^D/f^N increases. Since the disturbing frequency is generally fixed, the natural frequency of the mounting is made as low as necessary by increasing the deflection.

This relationship will be employed in the following section to show how the primary re-

quirement of an isolation material is determined.

Resonance: When the disturbing frequency equals the natural frequency of a structure or isolation material, an undesirable condition known as resonance takes place. At or near resonance, even a slight force is magnified many times. It follows that an isolating material having a natural frequency would be extremely undesirable, if not detrimental to the machine.

Dampening: As mentioned above, if a force is applied to a deflected elastic material, the material will oscillate at a given natural frequency.

Many materials, however, possess an additional quality of dampening. Without dampening, the material would continue to oscillate indefinitely at the same frequency. With dampening, the oscillations will slow down as a function of time.

In selecting the isolating material, dampening must be considered. Unfortunately, dampening and vibration transmission are directly proportional, and without dampening, the isolated machine will continue to oscillate indefinitely. Obviously, a happy medium must be reached in selecting the material.

Other Properties

Sound Insulation: Since vibration and noise go hand-in-hand, sound insulation qualities should be considered when selecting an isolation material.

Sound insulation ability in materials is measured by the mechanical resistance to sound conductivity (designated R. S. conductivity)—the product of the sound velocity and the density of the material.

Air is the ideal sound insulator, but for obvious reasons it is impractical as an insolator for vibration control. The next best insulator is rubber, which is used considerably because of this property. Cork, too, is an excellent sound insulator, being third on the list. Steel, however, of the vibration control materials, is the poorest insulator.

Modulus of Resilience: Many of the materials mentioned will pack and take a permanent set under an applied load. This inelastic action is undesirable for good insolation. Therefore, in determining the proper material, the resilience of the material is taken into consideraton.

Resilience is measured by the modulus of resilience, defined as the maximum amount of energy per unit volume which may be stored in a material by stress and completely recovered when the stress is removed.

Comparing the resilience of the various materials, it may be said that materials such as cork, felt, sand, and lead have low resilience; rubber-in-compression, higher; rubber-in-shear, much greater; and steel springs, the most.

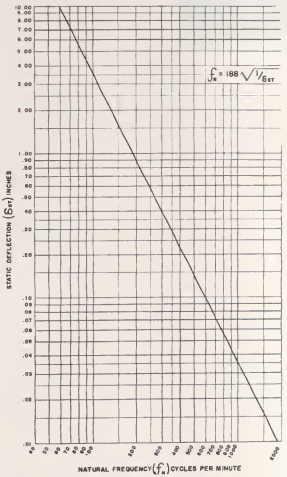


Fig. 1 — Natural Frequency vs. Deflection

SELECTING THE MATERIAL

Application of Theory of Vibration Control

To handle the large amounts of vibration problems to be solved, the vibration engineer has set up a system of charts and tables to provide quick, accurate results. For a demonstration to show the effectiveness of various materials, one of these charts will be employed (Fig. 5).

Figure two gives some minimum natural frequencies for various materials.

(Please turn to Page 18)

Dean's Column



Are you honest?

This innocent, but possibly offensive, question has been keeping my mind in a mild ferment for some time.

It came about this way. In common with most of your engineering faculty I read the Journal of the American Society for Engineering Education for edification, ideas, amusement, and news. In a recent issue there appeared an article titled "On Engineering Integrity" prepared by the Society's Committee on the Promotion of Ethical Standards (why are people so wordy). It isn't really a very good article—typical committee stuff—but a few thoughts that are interesting crept in, I suppose inadvertently.

On such is quoted "Persons of superior education and background, engineers and others, very largely agree upon what is right conduct and what s not.—It is a matter of conscience".

Now this bothers me. Should I trust my conscience to assure my integrity or more importantly your conscience and your integrity? What mysterious process insures the infallibility of this prescience of right or wrong? I know, as you and you and you and you know, that sometimes we take actions that do not appear honest to others. Some of you may have felt that you recognized such seeming dishonesty by some of the rest of us associated with you. Yet we all think of ourselves as essentially honest. Do we have different criteria of honesty, are there degrees of honesty (what comfort to believe that Joe or John or Jim is 75% honest). You know, come to think of it, of those people I know, many I think of as "unquestionably honest" by my criteria are those whom I know only casually. There is a peculiar anomaly in my own life. My standards of integrity have undergone considerable revision as I have become more exprienced. I countenance now as honest, some acts I once despised as dishonest. Yet at the same time there are fewer persons in my life whom I trust implicitly.

We have a well-recognized responsibilty as professional people to be honest, and the public generally considers engineers as being "unquestionably honest." The article referred to states that the inculcation of this professional integrity is a school responsibility, in fact, states we should have a credit course in ethics.

What nonsense; I don't know precisely how integrity is developed but I suspect it is not likely to result from a 2 semester hour course interpreting Cicero, Thomas Aquinas, Daniel Mead, or something called Ethical Philosophy.

(Please turn to Page 20)

Career Conference

The Fourth Annual Career Conference of George Washington University is scheduled for Wednesday evening, March 31, 1954. It will open in Lisner Auditorium at 7:30 p.m. with a two-member panel discussion of careers for college-trained people. At the conclusion of the General Assembly, the Conference breaks up into career groups or forums.

The Engineering Forum is being conducted by the Engineers' Council and current plans call for a four-member panel. The stated emphasis of the Conference, careers, is to be aimed at both the college student and the high school senior or junior. In engineering, the discussion will be directed toward what the potential engineer can gain (both financially and intellectually) and what he must contribute to make this gain. The panel discussion will have four focal points: the engineer in industry; the engineer in private practice; civil service as a career; and the engineer's education. The Council has received reasonably definite commitments from Dr. Ralph Goetzenberger, Vice-president, Minneapolis-Honeywell; Mr. M. X. Wilberding, President, Wilberding, Inc.; Mr. E. J. Stocking, United States Civil Service Commission; and Mr. H. H. Armsby, Office of Education.

The panel members have had broad experience in the engineering profession and each has had a thorough association with the problem of engineering manpower. The talks will be limited to 15 minutes so that those in attendance can ask questions more directly related to their own particular interests. The program should supply many with new information on the Engineering Profession. The invitation to attend The George Washington University Career Conference is open to all who are interested in engineering. If you know some parent with children in high school, invite them, and ask them to bring their offspring. Don't forget to keep the date open on your calendar.....G. W. Career Conference, March 31, Lisner Auditorium, 7:30 pm.

"We Should All Be Concerned"

by C. F. Kettering

Research Consultant, General Motors Corp.



Charles Franklin Kettering, nationally famous inventor and scientist, is noted for his invention of the automobile self-starter and his development work in connection with anti-knock fuels, automotive finishes, the high speed 2-cycle Diesel engine and high compression automobile engines. Since his retirement as Director of the General Motors Research Laboratories in 1947, he has been devoting a great deal of time to several fundamental problems of a scientific nature including an extensive research project on Photosynthesis.

Mr. Kettering has written this article for all members of Engineering College Magazines Associated.

Every year a certain number of you young fellows are handed diplomas and wished God-speed. Usually, along with the sheepskin, some dignitary will give you some advice—some constructive, some more or less oratorical. There is one thing, though, no one can give you on that momentous occasion—experience. So, in lieu of that, perhaps I can offer a few observations based on the results of experience —over 50 years of experience in the fields of research and engineering.

When you advance from year to year in your engineering course, whether it is mechanical, electrical, chemical, civil or what not, you may have the feeling that engineering is a never ending parade of formulas that must be memorized and applied. In other words, you may get the impression that almost any engineering problem can be solved if you can just find the right formula to fit it.

I certainly wish that was so. It would certainly simplify our research and engineering work. However—and this applies particularly to research work—we find formulas can be very misleading. Let me give you an illustration.

One of our research problems involved a simple beam about 23 inches long. In fact it was simply one of the leaves of an automobile spring which some of our people wanted to put to work in a production machine. They had figured it out several times and were sure this piece of steel was strong enough and flexible enough to do the job. But when they got the machine running, the springs began to break after about 2000 cycles. So they turned the problem over to research to get the answer.

We had five suppliers of leaf spring material send us some samples and tell us what they thought we should use after we gave them the working specifications. They all used the same formulas and the springs followed the formulas very well—they all agreed that about 2000 cycles was about right for the life of the spring.

We then asked them to send us some pieces of the spring material and mark them for identification. It didn't have to be a secret mark because we wanted each of them to get back its own piece. We gave each of those springs a physical treatment and returned them to the manufacturers for test. And none of them broke in **two million cycles!**

That was a one hundred thousand per cent improvement, and yet you would have been perfectly justified in saying that this material obeys the formula and therefore you can't expect anything else.

Please don't misunderstand me. I don't mean you should disregard every formula. But I think you should make sure your formula is applicable to the case you have at hand.

(Please turn to Page 24)

ALUMNEWS

Alums! Have you read the editorial? If not please turn back to page 5. As you can see your subscription is very important. Please fill out the form below and return with your subscription fee. Please, also, let us have news of yourself and comments on MECHELECIV.

Philip M. McKenna, BSME '21, President of Kenna-metal, Inc. of Lathrop, Pennsylvania, was awarded the Holley Medal by the American Society Of Mechanical Engineers at the society's recent Annual Meeting. Mr. McKenna was also selected to deliver the Towne Lecture at the meeting.

The new Washington consulting engineering firm of Gautney and Jones was formed this past January. **Mr. Carl Jones, BEE '42,** one of the members, was a former chief of the Federal Civil Defense Administration radio branch.

Robert F. Custard, BSE '50, of 618 Twenty-sixth Street, S. Arlington won the third session of the Times-Herald Bridge Tournament last January. Mr. Custard is employed in ordinance research by an industrial firm engaged in secret work at the Naval Ordinance Laboratory, White Oaks, Md. He is also a part time instructor in physics here at the University.

Will M. Heiser, BCE '49, of Wheat Ridge, Colorado, and Washington, D.C., a U.S. Bureau of Reclamation Engineer, is to join the U. S. Operations Mission in India as a power plant design engineer. He has been a structural engineer with the US Bureau of Reclamation at Denver, Colorado since 1949.

Dr. Murray Berdick, BSE '42, has been recently appointed as Coordinator of Research for Evans Research and Development Corporation. He has been a member of the Evans Research staff for five years. Prior to that, he was with the National Bureau of Standards and the General Electric Company.

Dr. Berdick is a member of Sigma Xi, Pi Lambda Upsilon, Sigma Tau, Pi Delta Epsilon, and Omicron Delta Kappa honor societies, and is listed in "American Men of Science."

Mr. Reginald L. Vassar, BEE '48, announces a change in mailing address to 16 Meyer Road, Hamilton, Massachusetts. Mr. Vassar is now employed by the General Electric Company, at the Lynn, Mass. Riverworks as a design engineer on d.c. motors and generators.

Mr. Edwin M. Thomas, BSE '34, LLB. '36, of 79 Great Hills Road, Short Hills, N.J., has recently been appointed Assistant Manager of the Patent division of Standard Oil Development Company. He served over eleven years as an examiner in the U. S. Patent Office, during which time he also served as Editor-in-Chief of the Journal of the Patent Office Society.

Joseph Rekas, B. C. E. '51 and his wife, Charlotte, are the proud parents of a 9½ lb. baby boy, born in Meadeville, Pennsylvania on December 30, 1953. Mr. Rekas is presently employed by the Bureau of Public Works Regional Office, Columbus, Ohio.

John W. Lewis, B. C. E. '51, and Edmund C. Hughes, B. C. E. 1952, are now Assistant Public Works Officers at MCAS, Miami, Florida, and 13th Naval District, Seattle, Washington, respectively.

Rudolph F. Besier, B. C. E. '50, is now an Ensign in the SeaBees, stationed at Guantanemo Bay, Cuba. He was formerly associated with W. H. Seabrooke Associates.

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Enclosed is check for $2.00 for my subscription to MECHELECIV for the calendar year 1954.

Comments: _____

A. I. E. E. Student Night

The Twelfth Annual Student Night sponsored by the Washington Section was held on February 13th on the Campus of the George Washington University. The evening was devoted to a dinner meeting held in the Student Union Building. Emanual L. Brancato, Chairman of the Section's Student Activities Committee, presided.

An Invocation was delivered by Col. W. J. Ellenberger, Vice-Chairman of the Washington Section. Following the dinner, the group was welcomed by Prof. N. B. Ames, Student Counselor for the George Washington University. Gravatt Coleman, Chairman of the Washington Section, welcomed student members and introduced N. S. Hibshman, Asst. Sec. of the Institute, Walter B. Morton, District Vice-President, and Leon Nonemaker, District Secretary, bringing greetings from Headquarters and from the District, as well as District Student Committee Chairman Ernest R. Welch, Student Counselor of Howard University, and District Membership Vice-Chairman Frank E. Martin.

At the conclusion of the welcome, the awards, consisting of a certificate and payment of one year's dues as an associate member, were presented. The honor was conferred upon one student from each of the four universities in the Washington area for outstanding work in promoting Student Branch activities.

Paul Emmons, Catholic University of America.

Paul M. Douglass, Jr., George Washington University.

James R. Duncan, Howard University.

Thomas R. Evans, University of Maryland.

The highlight of the evening was an address by Dr. A. V. Astin, Director of the National Bureau of Standards, who was introduced by Section Meetings and Papers Chairman Hamilton Treadway. Dr. Astin's talk "Some Research Trends in Electrical Engineering" discussed the phenomenal growth of the electrical engineering profession and pointed out trends indicating direction of future development. In conclusion Dr. Astin stressed the need for continuing basic research, not only to provide a reservoir of fundamentals essential to applied research and development, but also for its direct effect in enlarging the intellectual and spiritual values of life and preventing giving way to shortsighted materialism.



Col. W. J. Ellenberger, Vice-Chairman of Washington Section presents an award for outstanding work to James Duncan of Howard University.



Dr. D. V. Astin, Director of National Bureau of Standards speaks on "Some Research Trends in Electrical Engineering." Seated to his right is Mrs. Astin.

CONTEST RESULTS THE NAME'S THE SAME

In the October issue a contest was announced to determine opinion on a new name for MECHELECIV.

Judging from the landslide of letters and petitions from alumni and students protesting a change, the Engineers' Council voted at their January Meeting not to change the name.

ANNUAL IRE QUIZ PROGRAM

On March 3, the IRE held its annual quiz program in which a number of senior EE students were quizzed by a panel of judges on subjects both elementary and advanced in the general field of electrical engineering. The panel of judges consisted of Dr. Dorsey of CREI, Capt. Engelman of the Navy, Mr. Henry Price of Maryland U., and Mr. Balwanz and Mr. Abraham, both of GW. Dr. Dorsey acted as quizmaster for the evening. On the panel of students were Joseph March, Bernard Kilday, Herb Rosen, Bob Gardner, John Dodge and Bill Yates. The winners have not yet been made known, but will be announced at a future meeting.

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On Feb. 3, a group of students and professors from GW took an all day tour through Western Electric's Point Breeze manufacturing plant in Baltimore. This plant manufactures all of the cable and most of the plugs, cords, and connectors used in the Bell System. Among the many things of interest seen were the electroforming plant where copper, lead, and brass are electrically plated in layers on a stell wire core for use in customer drop wire, and the manufacturing of coaxial cable for use in intercity telephone and television hook-ups.

The January meeting of the IRE-AIEE was held on Jan. 6, in Monroe Hall. The members of the ASME were also present at the meeting for the evening's program.

The speaker for the evening was Dr. Ralph D. Bennett, Technical Director of the Naval Ordinance Laboratory. Dr. Bennett gave a most interesting talk on "The Professional Development of the Graduate Engineer." He said that there are two paths that can be taken by the recently graduated engineer. One is the specialized field where he learns more and more about less and less, and the other is the general engineering field where he learns less and less about more and more. He also stated that there used to be a time when it was thought that "us engineers don't need no English," but now he recommends that the engineering student take as many courses in English and public speaking as possible. Dr. Bennett concluded in saying that although engineering is not the highest paid profession, the engineer is rewarded with a very important asset—pestige.

Following Dr. Bennett's talk, Mr. Robert Beatty of NBS made an announcement that there were openings for engineers at their new laboratory in Boulder, Colorado. The work would be in connection with the Central Radio Propogation Laboratory. Mr. Beatty showed some color slides of the new building and the surrounding landscape.

OUR HAT IS IN THE RING

The Engineering School student body is entering a skit in the Annual All-U. Follies to be given April 30th in Lisner Auditorium. Students interested in participating may contact Derrill Rohlfs, Chairman or Bob van Sickler. It is hoped that a large turnout of engineering students and alumni will be seen on the opening night.



Brig. General David Sarnoff, Chairman of the Board, Radio Corporation of America

Sees No. 1 wish come true!

Television Tape Recording by RCA Opens New Era of Electronic Photography

In 1956, RCA's General Sarnoff will celebrate his 50th year in the field of radio. Looking ahead to that occasion, three years ago, he asked his family of scientists and researchers for three gifts to mark that anniversary: (1) A television tape recorder, (2) An electronic air conditioner, (3) A true amplifier of light.

Gift No. 1—the video tape recorder—has already been successfully demonstrated, two years ahead of time! Both color and black-and-white TV pictures were instantly recorded without any photographic development or processing.

You can imagine the future importance of this development to television broadcasting, to motion pictures, education, industry and national defense. And you can see its entertainment value to you, in your own home. There the tape equipment could be used for home movies, and—by connecting it to your television set—you could make personal recordings of your favorite TV programs.

Expressing his gratitude for this "gift," Gen. Sarnoff said it was only a matter of time, perhaps two years, before the finishing touches would bring this recording system to commercial reality. He described it as the first major step into an era of "electronic photography."

Such achievements as this, stemming from continuous pioneering in research and engineering, make "RCA" an emblem of quality, dependability and progress.

INTRIGUING OPPORTUNITIES FOR GRADUATING ENGINEERS

You're sure to find the exact type of challenge *you* want in Engineering Development, Design, or Manufacturing at RCA. Men with Bachelor's, Master's or Doctor's degrees in EE, ME, IE or Physics are needed. *You'll find your optimum career work* among the hundreds of products RCA produces for the home, science, industry and Government.

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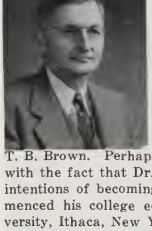
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ENGINEERING PERSONALITIES

Dr. Thomas B. Brown



Each and every student in the School of Engineering has at one time or acquainted himself with the Physics Department. Either directly or indirectly he has had the opportunity to work under the direction of the head of this department—Dr. T. B. Brown. Perhaps you are not acquainted with the fact that Dr. Brown at one time had intentions of becoming an engineer. He commenced his college education at Cornell University, Ithaca, New York, in 1908 as an engineering student. In his sophomore year, however, Dr. Brown switched to physics and in 1912 received his Bachelor's Degree.

Having a yearning for more education, Dr. Brown continued his studies at Cornell with a Doctorate in mind. He also taught a few courses while doing graduate work in order to have enough money to face the necessities of life. In 1916, he received his Doctorate in Physics and at about the time entered into the bonds of holy matrimony with the young lady who is now Mrs. Brown.

In 1917 Dr. Brown came to the George Washington University as an Assistant Professor of Physics and later rose to Professor of Physics and Executive Officer of the Physics Department. Since coming to the George Washington University Dr. Brown has had three books published. They are: **Modern Physics,** which has seen two editions; a Laboratory Manual for use in General Physics; and **Principles of Electron-Tube Theory,** which will be available in late March or early April of this year.

During the second World War, Professor Brown worked with the Naval Ordinance Laboratory and received a Meritorious Civil Service Award which can be seen on the wall of his office in Corcoran Hall. The Professor is an active member of the American Physics Society, the American Associaton of Physics Teachers, and the Washington Philosophical Society. He is also a member of Sigma Pi Sigma, physics honorary and Sigma Xi, a research honor society.

James Colangelo

Every student body has one personality that nearly everyone. In the George Washington School of Engineering, that person would have to be James Colangelo, the backbone of the Student Branch of the Civil Engineering Society.

Jim started working on his Civil Engineering degree in 1948, right after graduating from the Washington and Lee High School in Arlington, Virginia. His choice of the Civil Engineerng field was undoubtedly greatly influenced by his father, a Civil Engineer.

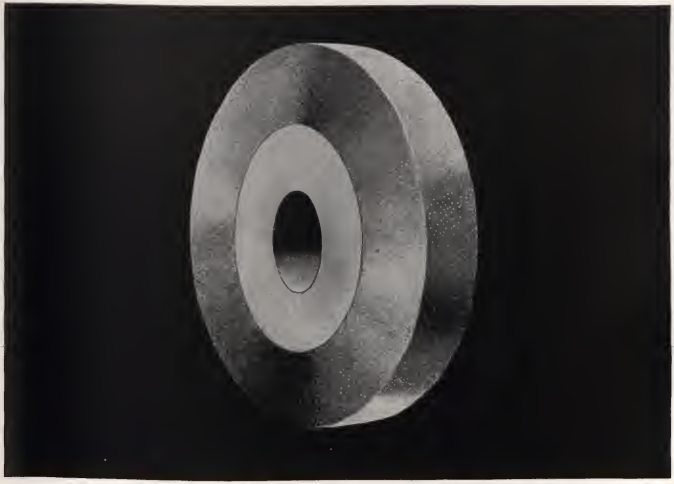


In 1949, Jim joined the Student Branch of the American Society of Civil Engineers. He was their 1952-53 representative to the Engineer's Council where he served as Vice President. During this term, he was also very active in laying the groundwork for the very successful Prestressed Concrete Conference which was held in January, 1953. To top off a very productive year, his presentation of a paper on "Elastic an Inelastic Buckling of Columns" won the speaking award offered by the A.S.C.E. for that year. In recognition of his services to the Student Branch of the A.S.C.E., the District Chaper presented Jim with a scholarship for the 1953-54 term.

James is also a member of the Theta Tau Fraternity and has served that organization both as Assistant Scribe and as Marshal.

The early life of James Colangelo was spent in Summit, New Jersey. It wasn't until 1945, after he had graduated from Summit Junior High School that his family moved to the Washington area. At the present time Jim and his wife, the former Lois Hoffman, have an apartment in the Shirley Duke development in Alexandria, Virginia.

At the moment, Jim is employed with the Holland Engineering Company of Alexandria, but his future plans will take him away from this area. The particular spot that he has his eye on is in New York City where he hopes to work in the Bridge Design Department of the Howard, Needles, Tammen, and Bergendoff Engineering Company.



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HEADQUARTERS FOR TECHNICAL AND BUSINESS INFORMATION

McGRAW-HILL FOR BUSINESS

(Continued from Page 9)

Material	Thickness	Load (psi)	Natural Frequency (cpm)
Natural Cork	1	15	2350
Hair Felt	1	35	1980
S.A.E. F-11 Felt	1	35	1140
Rubber-in-Shear	¼ defl.	-	386
Steel Springs—Std. Design Insolators	1-¼ defl.	-	168
Steel Springs—Special Designs	10 dfl.	-	60

Fig. 2 — Minimum Natural Frequency

By applying the information given in figure two to the above equation for percentage efficiency the following general problems may be solved as an illustration to show the effectiveness of the materials at different disturbing frequencies.

Efficiency at Low Disturbing Frequencies: High disturbing frequencies are usually considered to be above 1000 c.p.m. Equipment operated at these frequencies include fans, electric motors, generators, and centrifugal compressors.

The results of the demonstration for high disturbing frequencies will be listed in tabular form in figure three.

It will be noticed in this demonstration that resonance occurs when the frequency ratio (f^D/f^N) approaches unity. When the ratio is

Material	Fn-cpm	% Efficiency 1000 cpm	2000 cpm	3000 cpm
Natural Cork	2350	*	resonate	*
Hair Felt	1980	*	resonate	30%
SAE F-11 Felt	1140	resonate	60%	85%
Rubber-in-Shear	386	80%	96%	98%
Steel Springs-Std.	168	97%	above	above
Steel Springs-Spec.	60	above	above	above

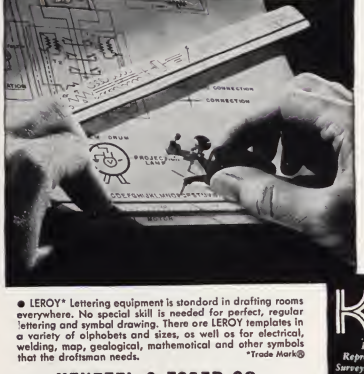
* The use of this material at this disturbing frequency multiplies the vibration through resonance.

Fig. 3—Isolation efficiencies at high disturbing frequencies

less than unity or near unity, the effect of the vibration is still increased. As the ratio increases above unity, approaching a value of five or more, maximum efficiency is obtained.

Efficiency at Low Disturbing Frequencies: Continuing the demonstration for disturbing frequencies below 1000 c.p.m., the results given in figure four are found. Most machine tools, reciprocating compressors, and some pumps operate at frequencies less than 1000 c.p.m. Since natural cork, hair felt, and S.A.E. F-11 felt were shown to be near resonance at 1000 c.p.m., they are of no use in this demonstration, since the effect of vibration transmission is multiplied when the frequency ratio is below unity.

(Please turn to Page 22)



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Student Responses:

Freshman: "I don't know."

Sophomore: "I'm not prepared."

Senior: "I don't believe I can add anything to what has already been said."

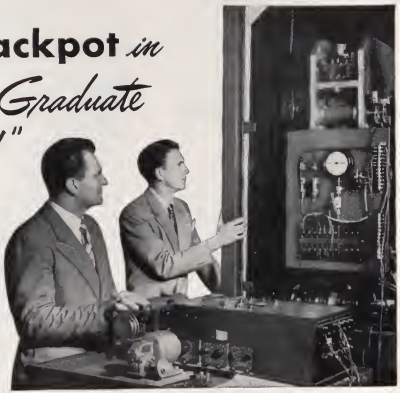
Now I lay me down to sleep,
The lecture's dry, the subject deep.
If he should quit before I wake
Someone kick me, for goodness sake.

A couple checked into the hotel and after cleaning up, forgot to turn off the faucets in the tub. A short time later the guest in the room directly below them opened his window and stuck out his head, "What's the matter?" he asked. "What the hell's ailing you?"

"Stop our cursing," the upper returned. "I've got a lady up here."

"And what do you think I have down here—a duck?"

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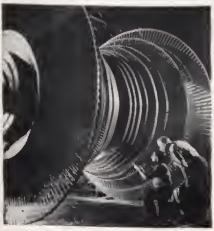
"Our experience shows what *can* happen if you work with people open to suggestion. We found men of this kind at Allis-Chalmers, and it has given us a special pleasure in our job.

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The important thing is that no one at Allis-Chalmers said, 'Don't try it—it won't work.' "

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"To make a long story short, our study of the problem led us to the hydraulic accumulator and high speed valves being used by the aircraft industry. These had not been available when earlier attempts were made to build a hydraulic operator. With these highly developed devices to work with, we were able to build an operator that combined the best features of pneumatic and hydraulic operation. We call it the *Pneu-draulic* operator. Engineers are saying it starts a new era in circuit breaker actuation.

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1. It's well established, having been started in 1904. A large percentage of the management group are graduates of the course.

2. The course offers a maximum of 24 months' training. Length and type of training is individually planned.

3. The graduate engineer may choose the kind of work he wants to do: design, engineering, research, production, sales, erection, service, etc.

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5. He will have individual attention and guidance in working out his training program.

6. The program has as its objective the right job for the right man. As he gets experience in different training locations he can alter his course of training to match changing interests.

For information watch for the Allis-Chalmers representative visiting your campus, or call an Allis-Chalmers district office, or write Graduate Training Section, Allis-Chalmers, Milwaukee 1, Wisconsin.

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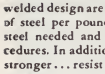
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DEAN'S COLUMN

(Continued from Page 10)

There is another little bit of wisdom in this article referred to as having started all this. It is that schools should be concerned with the motivation of students to comply with ethical standards. There is something to ponder. The more I examine his thought the more it attracts me. For how can one be dishonest if he is consumed with a desire to be honest. To my mind it would be very difficult.

It is probable that as a working procedure, most of us tend to judge others as we do ourselves. If we want intensely to be honest and some sort of standards, we accept as honest those of our acquaintance whom we know have the same approach, regardless of their acts. If they know we are dishonest, we tend to regard these acts as faults of judgment, not dishonesty or lack of integrity.

What do you think about honesty; I sure am curious to know. Now don't just talk about it, for it is too easy to use a lot of breath without thinking, why not write your ideas to me or MECHELECIV.

Vagrant Thought

"I have had more trouble with myself than with any other person I know."—Dwight Moody. This just popped into my head as I finished the above, seems appropriate too.

GRADUATE STUDY

(Continued from Page 9)

year. Many fellowships require no teaching duties and still yield about $1200. Some awards need investigating to prevent yourself from getting tied up in some "slave labor" deal. The Fellowships are plentiful and offer no real challenge to the undergraduate, although I suggest that one must really pound the texts to maintain the prestige and faith accompanying the award. One point I must emphasize. The best advocate and champion for your cause is the Dean of Engineering. His office is set up to process your letters of recommendation and to assist you in any way possible. However, you must have at least minimum scholarship requirements and you must make known your desire to apply for a scholarship. There is no mind reading service attached. Here are hundreds of opportunities to get your higher education for free. It's very much like buying a suit of clothes. You've got to shop around until you find the right fit at the best price.

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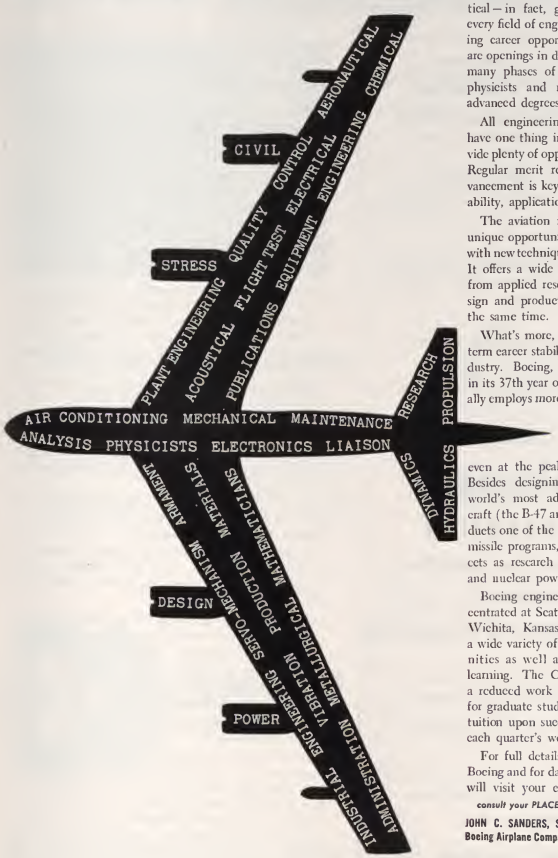
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 (Continued from Page 18)

Material	Fn-cpm	% Efficiency 900 cpm	700 cpm	800 cpm
Rubber-in-Shear	386	78%	60%	10%
Steel Springs-Std.	168	96%	94%	88%
Steel Springs-Spec.	60	above	above	98%

Fig. 4—Isolation efficiencies at low disturbing frequencies

ISOLATORS

Single Material Isolators

From the chart in figure five, it is noticed that only one of the materials, rubber-in-shear, may be used by itself for fairly good isolation.

Actually, "rubber-in-shear" refers to a method of using rubber to solve vibration problems—the rubber isolator. Rubber-in-shear will give good results for most applications, except for low disturbing frequencies or under abnormal conditions.

The standard designs of rubber-in-shear mountings do not allow the rubber to act completely in shear, but partly in compression as well. This is to eliminate the possibility of damage to the machine in case the rubber fails.

Even rubber, when used in shear, does not give the perfect isolator. It has been found, however, that by combining two or more of the materials a much better isolator is the result.

CONCLUSION

Although it was impossible to cover this dynamic field more thoroughly in this paper several valid conclusions may be drawn directly from the discussion:

1. The steel spring isolator, as described in the last section is by far the best general purpose isolation mount available.

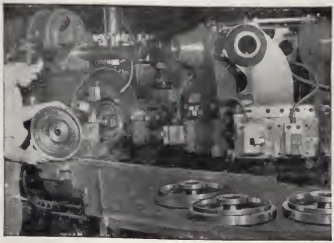
2. In cases of medium to high disturbing frequency isolation only, the rubber-in-shear isolator, as described in the previous section, is adequate.

3. For noise isolation alone, and in some cases of high frequency, low efficiency isolation, rubber-in-compression or cork materials are sufficient.

4. Other materials in use today, such as sand, lead, and some grades of cork and felt, are definitely undesirable and may be detrimental to the installation.

5. A final conclusion may be drawn from a brief survey of the history of the field—the field is a dynamic one, alive to the increasing need for more efficient isolation. If the past ten years of rapid advancement in this relatively new area of interest are extrapolated into the future, an extreme effect is seen upon the factory, home, office, or ship of the year 1964. After that, only time will tell.

Another page for **YOUR BEARING NOTEBOOK**

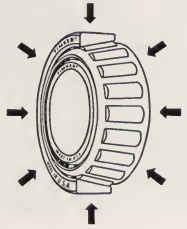


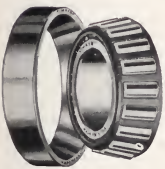
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"WE SHOULD ALL BE CONCERNED" . . .

(Continued from Page 11)

You read a lot these days about the great calculating machines used to solve difficult problems but we have been using a giant calculating machine for years—our Proving Grounds covering thousands of acres. We don't put in something and push buttons and wait to see what comes out. We put an entire automobile into our machine and drive it 25 thousand miles, tear it apart and inspect every piece. These tests and our Proving Grounds are just as much computing machines as the modern integrating machines with their vacuum tubes—and the results are far more conclusive.

And this machine has helped us greatly to improve tires. Here is an automobile, we put on two new tires, one on the front wheel and one on the back, diagonally opposite and run them around under the same conditions as the average driver encounters. After thousands of miles of this kind of usage we examne the tires and say "This tire is better than that one." So we use these roads as integrating machines and the results have been beneficial to everyone.

The most successful engineer tomorrow will be the one who can intelligently apply formulas and calculate things that can be calculated, yet is able to recognize that intelligent experimentation is the only way to solve certain problems. He doesn't have to belong exclusively to a mathematical or an experimental group—he should be adept at using either tool.

So often we think we can **design** a thing without letting the thing speak for itself. Actually, in our research work we have discovered one of the best methods of getting results is simply to run errands for an idea.

For example, we designed what we thought was an ideal piston for a new Diesel engine but the engine in which the piston was tested had different ideas and said "I'll only give you 50 thousand miles on that one". So we made up half a dozen different kinds of pistons and offered them to the test engine, one by one, for its verdict. And to show you how much smarter the engine was than our engineers, the piston it finally selected ran over a million and a half miles.

I remember a well-known engineering educator who visited me after that said "I don't think that piston is any good. It is the most peculiar looking thing I ever saw, and I know it isn't right."

I asked, "How do you know that?"

He said, "I am an engineer".

"But", I asked, "Were you ever a piston in a Diesel engine?" And when you get out into the world of business you will run into some representatives of the "can't be done" school like the Englishman who visited me some years ago. He said to me "when I was over here last year you told me you were driving these Diesel-electric trains over a hundred miles an hour and now I find you take power off the front wheels of your locomotive. You can't do that and stay on the track at that speed."

"Well", I said, "I hope the locomotive doesn't discover that."

And he said, "I have the figures and the formula right here in my briefcase to prove it."

"No", I said, "I won't look at those but I will arrange a ride on that train for you."

To make a long story short, he took a ride on the train from Chicago to Denver and on his returned dropped into my office. I told him I was surprised to see him alive since he must have gone over a hundred miles an hour. He said "Do you know what they did for me when I was up in the cab? They put the locomotive up to 120 miles an hour and it had no tendency to jump the track. The thing that worries me is how we could be so absolutely wrong in every detail."

"The reason you were wrong", I explained, "was simply because your figures had nothing to do with this locomotive. They applied to another type of locomotive which we do not build".

He was talking about a rigid frame locomotive, while our locomotives have individual trucks like every railroad car but we put motors on them. But here was a man who was perfectly willing to say, without a trial, that it was impossible to do what we were already doing.

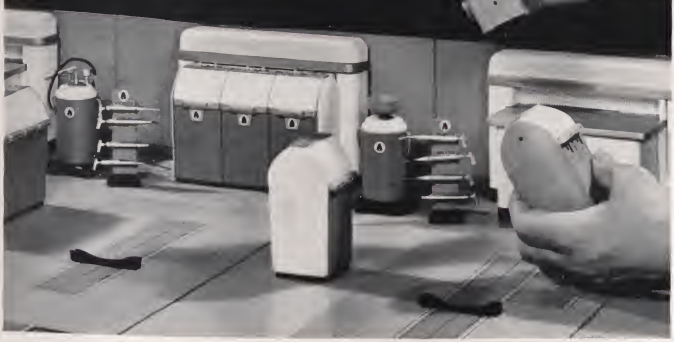
These are a few of the things you are apt to run into which are probably not covered in the text books you have gone through. But there are other things you will encounter which neither I nor any other person can predict. They are the thousands of opportunities that lie ahead—the thousands of things that need to be done to fulfill the needs and desires of our rapidly growing nation. And when you travel along that road to Tomorrow, keep your eye on the road up there ahead, not on the rear view mirror, because we should all be concerned with the Future since there's where we are going to spend the rest of our lives.

PHOTOGRAPHY AT WORK—No. 8 in a Kodak Series

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